iXM-RS100F Calibration Certificate
In Flight Calibration

Camera system: iXM-RS100F, Rodenstock RS-50mm
Serial number: MI010007
Calibration ID   MI010007_50mm_20240201
Manufacturer: Phase One A/S, Roskildevej 39, 2000 Frederiksberg, Denmark
Certificate issue date   22-03-2024

The camera system is fully functional within the specifications defined by Phase One A/S.

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Phase One A/S

Table of Contents

1. Introduction

This document describes the calibration results for the iXM-RS100F camera system with Phase One Rodenstock RS-50mm lens.

The system has been calibrated in flight by the Phase One as described in section 3.

With the signature on the front-page Phase One is assuring the full functionality and accuracy of the system within the specifications defined by Phase One A/S.

It is recommended to recalibrate the system every two years.

2. Calibrated system components

The following table lists the components of the system. Calibration has been performed on a fully assembled system. Disassembly or modification will void the validity of the calibration.

iXM-RS100F	
Serial Number	MI010007
Resolution	100MP
	11608 x 8708
Pixel Size (microns)	4.6
Effective Sensor Size (mm)	53.4 x 40
Light Sensitivity (ISO)	50-6400
Capture Rate (FPS)	1.6
Spectral characteristics	RGB

Rodenstock 50mm Lens	
Serial Number	12537936
Aperture Range	f/4 – f/22
Shutter Speed Max.	Up to 1/2500 sec
Angle Of View – Long Side	54.6
Angle Of View – Short Side	42.3°

3. Calibration procedure: In Flight Calibration

The camera system has been calibrated in flight calibration procedure. The characteristic of the flight is shown in the next table.

Flight parameters	
Flight date	01-02-2024
Mean GSD (cm)	5.66
Flight altitude (m)	620x620x810
Side/Forward overlap (%)	80/80
Strips	10 x 2 x 3
Number of images	385
Block accuracy	
GCPs	**104**
RMSEx (cm)	2.78
RMXEy (cm)	2.91
RMSEz (cm)	1.60
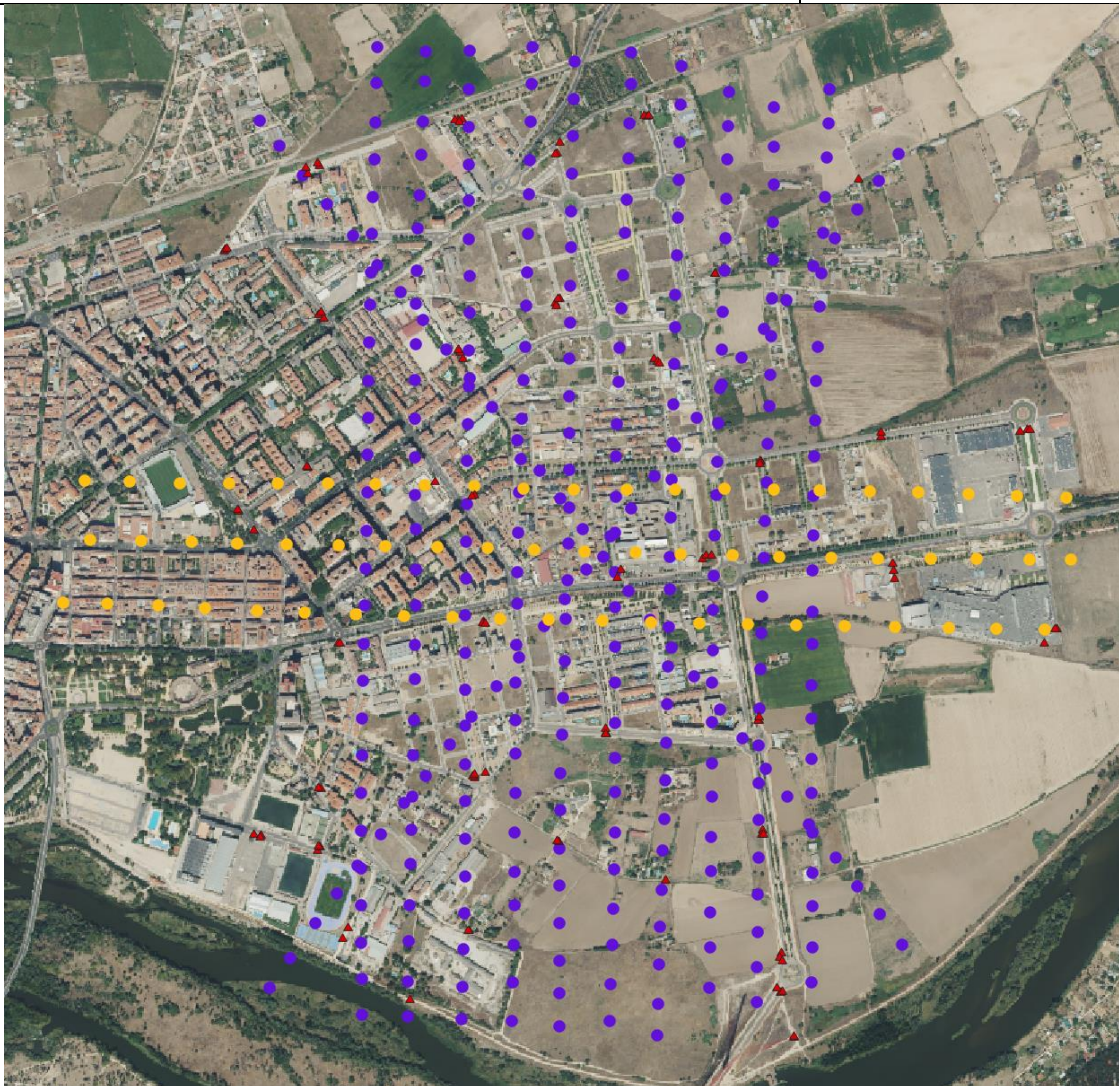
4. Calibration Result

Calibration Information (Australis model)

This section presents geometric correction parameters in standard format [*] for input into 3rd party photogrammetric software.

	Value	STD
Focal length C (mm)	51.6274	0.0000
Xp (mm)	0.0238	0.0001
Yp (mm)	-0.0057	0.0000
K1	1.48374e-05	3.07271e-09
K2	-4.07431e-09	6.33629e-12
K3	1.89638e-13	3.92148e-15
P1	-3.48383e-06	5.98600e-09
P2	-1.39077e-06	4.91558e-09
B1	-1.63012e-05	2.30809e-07
B2	1.50020e-05	2.23021e-07

The coefficients follow the model used by the photogrammetric software Australis where the corrected image coordinates (x_{corr}, y_{corr}) can be calculated from the measured coordinates (x_{meas}, y_{meas}) by using the following formulas:

$$x = x_{meas} - x_p$$

$$y = y_{meas} - x_p$$

$$r^2 = x^2 - y^2$$

$$dr = K1 \cdot r^3 + K2 \cdot r^5 + K3 \cdot r^7$$

$$x_{corr} = x + x \cdot \frac{dr}{r} + P1 \cdot (r^2 + 2x^2) + 2 \cdot P2 \cdot x \cdot y + B1 \cdot x + B2 \cdot y$$

$$y_{corr} = y + y \cdot \frac{dr}{r} + P2 \cdot (r^2 + 2y^2) + 2 \cdot P1 \cdot x \cdot y$$

(*) on request specific formats and corresponding files can be delivered.

Image residuals

After geometric calibration remaining residuals in image plane have a

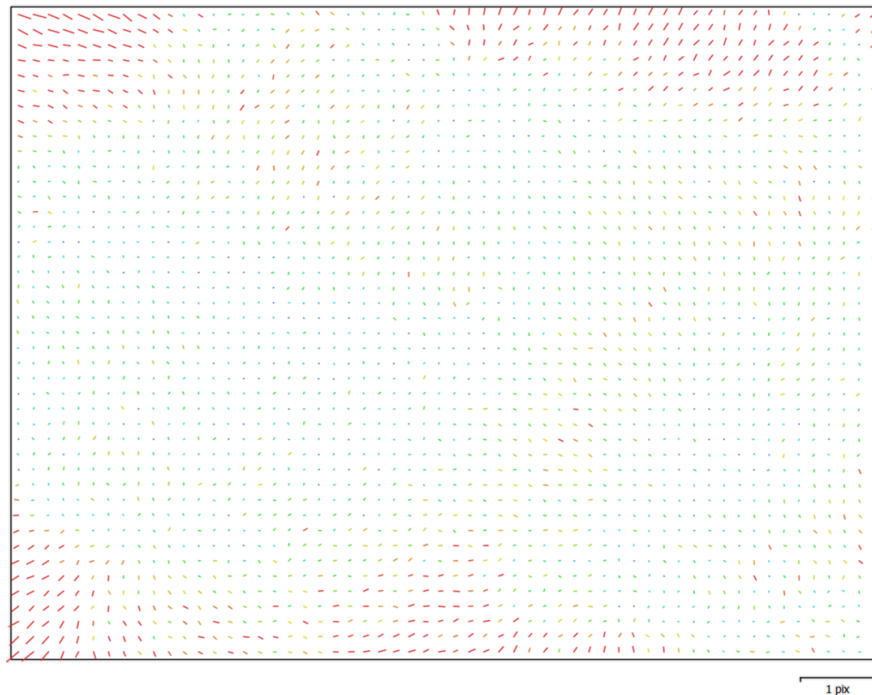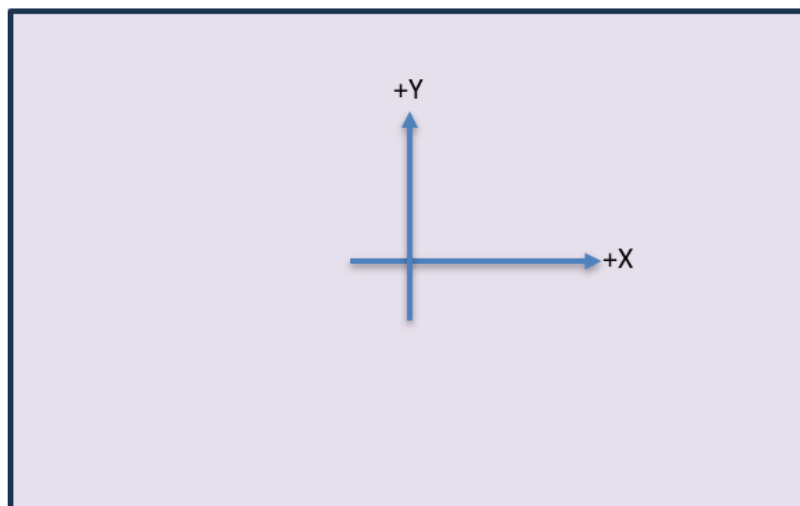- Maximum error of 0.202 pixels

- RMS error of 0.039 pixel

Image Coordinate System

The image coordinate system for an iXM-RS100F camera system is illustrated the next image:

5. Distortion Free Images

iX Process und **iX Capture** offer the possibility to apply all calibration corrections into the image and provide a distortion free output image.

The parameters of a distortion free output are:

Parameter	Value [mm]	RMSE [mm]
Focal length		
C	51.6274	0.0001
Principal point offset		
xp	0.0	0.0001
yp	0.0	0.0000

Parameter	Value	RMSE
Radial distortion		
K1	0	3.07271e-09
K2	0	6.33629e-12
K3	0	3.92148e-15
Radial-asymmetric and tangential distortion		
P1	0	5.98600e-09
P2	0	4.91558e-09
Affinity and non-orthogonality		
B1	0	2.30809e-07
B2	0	2.23021e-07